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Female Students' Perceptions of Artificial Intelligence and STEM in Tanzania: Insights from an AI Awareness Workshop

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Abstract

The underrepresentation of females in Artificial Intelligence (AI) remains a global concern, with implications for both equitable participation and the inclusivity of AI-driven solutions. While efforts to promote gender equality in Science, Technology, Engineering, and Mathematics (STEM) have increased, limited research examines how female students perceive AI and their participation in it, particularly in developing-country contexts such as Tanzania. In Tanzania, limited exposure to emerging technologies, constrained access to digital resources, and persistent gendered perceptions continue to restrict female students' participation in STEM and AI pathways. This study investigates the perceptions, awareness, and participation of female secondary school and university students in AI. Using a qualitative research approach, data were collected during an AI awareness and sensitisation workshop on Artificial Intelligence concepts, applications, and careers organised under the *Girls in AI* initiative by DarasaTech in partnership with AI4D Labs. The workshop involved presentations, group activities, and focus group discussions. Data from these interactions were analysed using an open coding approach to identify key themes. Findings indicate that exposure to AI concepts significantly improved participants' understanding of AI beyond common misconceptions, such as associating it solely with robots, to recognising its application in everyday life and community problem-solving. The study also found a generally positive attitude toward technology and increased interest in pursuing STEM-related careers. However, several barriers to participation were identified, including low self-confidence in science subjects, limited access to technological resources, insufficient institutional support, and a lack of female role models. The study highlights the need for early integration of STEM education, increased access to learning resources, and targeted mentorship programs to support female participation in AI. These findings provide valuable insights for educators and policymakers seeking to foster inclusive and contextually relevant AI ecosystems in Tanzania and similar settings.

Keywords: Artificial Intelligence (AI), STEM Education, Female Students, AI Literacy, Women in STEM, Technology Perception, Digital Inclusion, Tanzania.

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1. Introduction

Abundant research points to artificial intelligence as the fastest-growing technology in the world (i.e., Ray, 2023; Alam & Khan, 2022). In 2022, the global artificial intelligence market size was valued at USD 136.55 billion and is projected to expand at a compound annual growth rate (CAGR) of 37.3% from 2023 to 2030 (Grand View Research, 2023). Technology experts consider AI the future of everyday life as it touches every sector from farming and agriculture to banking and finance, healthcare, telecommunication, education, and governance (i.e., Ray, 2023; Radha, Ranganath, Mathur, Abdullah, Sasidharan, & KM, 2023; Sahu, 2021; McAlister, Alhabash, & Yang, 2024); Parihar, Kinhikar, Khan, Purswani, & Singh, 2023). Artificial intelligence is at the heart of the growing demand for machine-assisted automated technologies, i.e., self-driving cars, home appliances, and humanoids.

Despite the rapid global advancement of technology, females, particularly in artificial intelligence, are discouragingly underrepresented. Though the percentage of women in the so-called male-dominated fields has increased, the disparity is staggering. According to the World Economic Forum (2023), only 22% of AI employees globally are female, while women comprise 49.6% of the world's population. Much research has already been done on the topic of the underrepresentation of women in Science, Technology, Engineering and Mathematics (STEM) disciplines highlighting a variety of associated issues and factors including lack of awareness, early misconception about technology, higher levels of attrition compared to males, and highly demanding careers (Okeke & Ramaila, 2025; Kwiek & Szymula, 2025; Tully, 2017).

Nonetheless, the disproportionate number of female AI engineers, researchers, and developers, coupled with the gender divide in digital and STEM skills, contributes to gender biases within AI algorithms that reinforce gender stereotypes and perpetuate gender inequities and discrimination against women. (Manasi, Panchanadeswaran, Sours, & Lee, 2022). While AI may appear neutral, the gender biases manifested during the algorithm's development, the training of datasets, or via AI-generated decision-making, directly affect AI applications' design and development and translate to products and services that do not serve everyone (Women in Tech, 2022). Essentially, AI appears to mirror existing gender bias in sectors, i.e., healthcare, product development, agriculture, or marketing (Manasi, Panchanadeswaran, Sours, & Lee, 2022). In actuality, the rapid advancement of technology demands a highly skilled and dedicated workforce of both men and women.

While literature suggests that businesses and governments globally are positioning themselves to maximise the opportunities in AI, evidence shows that countries in the Global North are better prepared to reap the benefits of AI compared to their counterparts in the Global South, i.e., Africa (Arakpogun, Elsahn, Olan, & Elsahn, 2021). Ensuring that AI technology works for all of society starts with fair and deliberate diversity, inclusion, and localisation (Chi, Lurie, & Mulligan, 2021). African innovators, policymakers, social movements, and academic institutions must ramp up their engagement in AI (Arakpogun, Elsahn, Olan, & Elsahn, 2021), including increasing women's participation in the field that is currently male-dominated.

However, given that AI is a relatively new concept in developing countries, much investigation is needed to understand awareness, readiness, and perception of AI technology. Moreover, research must focus on understanding females' perception of AI and their important contribution to AI advancement and society. Although researchers have attempted to understand the engagement of females in STEM fields (Okeke & Ramaila, 2025; Morgan, 2022), limited evidence of research exists on the awareness and readiness to engage with AI from the female perspective, particularly in the context of Tanzania. In the Tanzanian context, the challenge is not only the underrepresentation of women in STEM but also limited awareness and exposure to emerging fields such as Artificial Intelligence (AI) among female students. Many students progress through the education system with minimal interaction with digital technologies. This creates a critical disconnect between education and the rapidly evolving digital labour market. This is further compounded by gendered perceptions that position STEM fields as male-dominated, alongside constrained access to learning resources, mentorship, and supportive learning environments. As a result, a significant number of females may not consider or pursue pathways in AI and related disciplines, not due to lack of ability, but due to limited exposure, confidence, and institutional support. This underscores the urgency of targeted interventions that can bridge awareness gaps, reshape perceptions, and strengthen participation at early stages of education. This merits research attention.

The objective of this research is threefold:

- To investigate the perceptions of females towards their role in STEM, technology, and AI
- To identify the challenges/barriers that discourage females from pursuing STEM, technology, and AI
- To identify mechanisms that can be used to improve/accelerate women into STEM, technology, and AI careers

To achieve these objectives, the *Girls in AI* platform, founded by DarasaTech in partnership with AI4D Labs, organised an AI awareness workshop in Dar es Salaam, Tanzania, involving secondary school and university female students and conducted research via focus group discussions and group presentations.

The findings of this research seek to shed light on the current awareness and perception of females towards technology education and careers. It is anticipated that these findings will help provide a compass to education practitioners and policymakers in creating policies that will stimulate a female-friendly learning ecosystem that fuels AI adoption and innovation among African youth, especially females.

The rest of the paper provides a background of the *Girls and AI* platform initiative and summarises literature on the participation of females in AI, and the role of AI in Africa, before providing a detailed account of methodology, findings, discussion, and conclusion.

2. Background & Literature

2.1. AI and Gender

The underrepresentation of females in technology, particularly AI, is a deep-seated concern. AI programs are predominantly created by male developers, drawing from large data sets that reflect negative social biases toward females. If left unchecked, AI systems will continue to draw responses from data containing many of the gender biases that have emerged from structural and historical gender inequalities, threatening to amplify these inequalities. Scholars attribute the low participation of females in tech to self-belief about their abilities in male-dominated domains (Fornasari & Bannò, 2025; Archer, Moote, MacLeod, Francis, and DeWitt, 2021), perceived chilly STEM classroom environments for female students, male-dominated work culture, lack of female role models, the negative impression to some women on how to cope with the demands of the fast pace tech industry and take care of family, the high attrition rate of women in tech compared to males and sexual discrimination (Wilkins-Yel, Arnold, Bekki, Natarajan, Bernstein, & Randall, 2022; Abe, & Chikoko, 2020; Gladstone & Cimpian, 2021; Arakpogun, Elsahn, Olan, & Elsahn, 2021).

Although gender inequality in AI remains a deep-rooted reality for women in many African countries, several initiatives exist in Tanzania geared toward mainstreaming youth and females into STEM, i.e., the *She Code* initiative by the Launch Pad and *Girls in AI* by DarasaTech & AI4D Labs that invests in women coders and programmers, and information and communications technology training. Moreover, proactive policies have been adopted by the Government of Tanzania to increase the number of females taking up STEM subjects and computer science (Psaki, Haberland, Mensch, Woyczynski, & Chuang, 2022). Yet, given the novelty of AI as a relatively new concept in Tanzania, much ground needs to be covered to raise awareness of the importance of gender mainstreaming and the participation of females in technology and AI in particular, to reduce or eliminate gender bias in AI. Developing awareness and capacity-building programs that target females at the grassroots level would go a long way in achieving the critical mass of human capital needed to boost AI capacity in Africa. Part of this section could strengthen the background section to see the impetus for carrying out this study. However, while these studies highlight structural barriers, they provide limited insight into how female students in specific contexts, such as Tanzania, perceive and engage with AI, particularly at early stages of exposure.

2.2 AI and Africa

AI presents a great opportunity to contribute to a broad range of sustainable development goals, such as health, education for all, clean water and sanitation, and climate change (Arti & Kumar, 2025; Oyelere, Sanusi, Agbo, Oyelere, Omidiora, Adewumi, & Ogbebor, 2022; Rutenberg, Gwagwa, & Omino, 2021). However, Africa is unable to take full advantage (Alaran, Lawal, Jiya, Egya, Ahmed, Abdulsalam, Lucero-Prisno, 2025; Arakpogun, Elsahn, Olan, & Elsahn, 2021), as many countries lack a steady pipeline of home-grown and skilled AI development talent and mentorship programs (Ajadi & Sharma, 2020).

Despite the limited awareness of AI, AI ecosystems exist in Africa, with evidence of pockets of activities across the continent, such as IBM in Kenya and South Africa, possessing the essential elements for AI R&D, i.e., the financial, human, data, and computational resources to deploy sophisticated algorithms (Gwagwa, Kachidza, Siminyu, & Smith, 2021). However, many of these ecosystems are under-resourced and face challenges, particularly in human capital, skills, capacity building (He, 2025; Arakpogun, Elsahn, Olan, & Elsahn, 2021; Gwagwa, Kachidza, Siminyu, & Smith, 2021) and gender disparity (Dlamini & Ndzinisa, 2025). These challenges are further compounded for female students, who face additional gender-specific barriers in accessing digital skills and opportunities within AI ecosystems.

2.3 The *Girls and AI* Platform

In response to the need to increase awareness of AI among youth in Tanzania, especially females, DarasaTech, in partnership with AI4D Labs, launched a platform called *Girls in AI*. Founded in 2023. The platform aims to create awareness of AI and provide capacity-building programs that introduce basic computational concepts of AI, machine learning, and deep learning to secondary and university students in Tanzania. The goal is to inform and educate about the potential of AI in solving community challenges and to spread awareness of the critical role of women in AI. These objectives are achieved through awareness and capacity-building workshops involving secondary school and university students, secondary teachers, and lecturers.

While existing literature highlights gender disparities and the growing relevance of AI, there remains a limited understanding of how female students perceive and engage with AI within specific contextual settings, such as Tanzania. To guide this study, the following theoretical frameworks are adopted.

2.4 **Theoretical/Conceptual Framework**

This study is guided by the Social Cognitive Career Theory (SCCT), Brown & Lent (2019), which explains how individuals develop career interests and make academic and professional choices based on the interaction of personal, behavioural, and environmental factors. Central to SCCT are constructs such as self-efficacy, outcome expectations, and perceived barriers, which influence an individual's motivation and participation in specific fields (Brown & Lent, 2019). In the context of this study, students' confidence in STEM subjects reflects self-efficacy, while their perceptions of AI careers relate to outcome expectations. Environmental influences such as teacher support, access to resources, and exposure to role models represent contextual factors shaping participation.

To further understand gendered perceptions in technology fields, the study also draws on Gender Schema Theory (Bem, 1981), which posits that societal norms and stereotypes influence how individuals perceive roles appropriate for their gender. This framework helps explain the persistence of beliefs that STEM and AI are male-dominated domains, as reflected in participants' experiences (i.e., Diana & Dareny, 2025).

Additionally, elements of the Technology Acceptance Model (TAM) (Davis, 1989) are relevant in explaining how exposure to AI during the workshop influenced participants' understanding and acceptance of the technology. As students became more aware of AI applications in everyday life, their perception of its usefulness and relevance increased, contributing to greater interest in engagement. Together, these frameworks provide a conceptual lens through which the perceptions, barriers, and participation of female students in AI can be understood.

3. Methodology

This study used a qualitative research approach to achieve its objectives. A qualitative approach involves collecting non-numeric data, including texts, pictures, and video clips from interviews, focus group discussions, and observations (Saunders, Lewis & Thornhill 2007). A triangulation approach was employed involving workshop brainstorming sessions and presentations, focus group discussions, and a secondary data review.

3.1 The *Girls in AI* Sensitisation and Awareness Workshop

Through the *Girls in AI* platform, which was launched on 8th March 2023 in commemoration of International Women's Day (IWD), DarasaTech, in partnership with AI4D Labs, hosted a full-day AI sensitisation workshop at Buni Hub – COSTECH Dar-es-salaam. The activities lined up at the workshop included presentations and panel discussions, a tea and lunch break, followed by group exercise, focus group discussion and group presentations.

The workshop involved a series of activities with the following objectives:

- ***Objective 1*: To educate and spread awareness of the role of gender in AI.**
  This was done through presentations by academic experts on what AI is, the potential of AI in solving community challenges and the role of gender in AI; and 2 group panel discussions by industry experts and academicians on STEM and AI career options, and recent AI research and practice in Tanzania.
- ***Objective 2*: To investigate issues related to the participation of girls and women in STEM and tech fields, particularly AI.**
  This was achieved through qualitative research that involved group break-out sessions in which all participants broke into numerous groups to discuss research questions. This was followed by group presentations and finalised with focus-group discussions. Data was collected through focus group discussions and group presentations.

3.2 Research Questions

To explore in-depth issues related to the participation of females in STEM and tech fields, particularly in AI. The following questions guided this study:

- ***Research Question 1****: What are the perceptions of females towards their role in STEM, technology, and AI?*
- ***Research Question 2****: What are the identified challenges/barriers that could discourage females from pursuing STEM, technology, and AI?*
- ***Research Question 3****: What alternative mechanisms can be used to improve/accelerate females into STEM, technology, and AI academics and career paths?*

3.3 Population and Sampling

This study adopted a combination of purposive and simple random sampling techniques to select participants. Purposive sampling was used to select 20 secondary school girls from a secondary school in Dar es Salaam, accompanied by two teachers. This group was intentionally chosen because they represent a critical stage in the educational pipeline where perceptions of Science, Technology, Engineering, and Mathematics (STEM) and future career aspirations are actively formed. Additionally, the inclusion of teachers provided complementary perspectives on classroom experiences and learning environments, particularly in relation to the teaching and uptake of STEM subjects.

The target population for this study comprised female secondary school and university students in Dar es Salaam with exposure to the AI awareness workshop. A simple random sampling technique was used to select 15 female university students from four higher learning institutions in Dar es Salaam. University students were included to capture perspectives from individuals at a more advanced stage of academic and career decision-making, thereby enabling comparison across different educational levels. Furthermore, university lecturers and industry experts were selected through an invitation to participate in the focus group discussions. Their inclusion was intended to enrich the discussions by providing expert insights and broader contextual understanding of STEM and AI education and practice. The combination of these participant groups allowed for the collection of diverse, information-rich data relevant to the study objectives. Purposive sampling, in particular, is appropriate for qualitative research as it enables the selection of participants who are most relevant to the phenomenon under investigation, rather than aiming for statistical generalisation.

3.4 Validity and Reliability

To ensure the validity of the study, the research instruments were reviewed by two academic experts from Ardhi University and the University of Dodoma. Their feedback focused on improving clarity, relevance, and alignment of the research questions with the study objectives, thereby enhancing content and face validity. In addition, data triangulation was employed through the use of multiple data sources, including focus group discussions, group presentations, and workshop observations. This helped to ensure that the findings accurately reflected participants' perspectives from different angles.

Reliability was strengthened through the use of a structured and consistent data collection process. All focus group discussions were guided by the same set of research questions across participant groups, ensuring uniformity in data collection. Furthermore, all sessions were documented through written notes and video recordings to ensure accurate capture of responses. During analysis, an open coding approach was systematically applied, where responses were categorised based on recurring themes to ensure consistency in interpretation. This transparent and systematic approach enhances the dependability and trustworthiness of the findings.

3.5 Focus group discussions

The participants were divided into five focus groups of seven members each. Each group was assigned the same set of guiding research questions focusing on perceptions of STEM and Artificial Intelligence (AI), barriers to participation, and potential strategies to enhance female engagement in these fields. They were given one hour each, after which each group appointed a representative to present the group's findings to the entire audience. An additional 15 minutes were given to each group after the presentation for commentary to further facilitate the exploration of ideas from fellow group members. This process enabled the exchange and validation of ideas across groups while maintaining focus on the study objectives.

3.6 Data Collection

Data were collected using multiple qualitative methods, including focus group discussions, group presentations, written group responses, and direct observations during the workshop sessions. The focus group discussions were guided by structured questions aligned with the study objectives to ensure consistency across all participant groups.

In addition, written group responses (answer sheets) were collected at the end of group deliberations to capture key points discussed. Observational notes were taken throughout the workshop sessions by the facilitators to document participant engagement and interactions. All group presentations were also recorded using video recordings to ensure accurate documentation of responses. The use of multiple data sources enhanced the richness of the data and allowed for triangulation of findings. This multi-method approach ensured both depth and breadth in capturing participants' experiences and perceptions.

3.7 Data analysis

An open coding approach based on the Grounded Theory Method (i.e., Belgrave & Seide, 2019) was employed to categorise similar statements, opinions, and experiences discussed during the focus group. The data obtained through the workshop and focus group discussions were subjected to analysis using transcribing and coding. Responses were summarised into several different categories, and the categories were identified after looking through the range of responses received from each group and respondent. Each response category was assigned a number.

4. Findings

The study's research and findings were guided by the questions below:

a. The role and importance of females in STEM and AI

i. Attitude towards technology

Participants generally expressed a positive attitude toward technology, particularly in its role in addressing community challenges and supporting development. Many recognised technology as an essential driver of progress across various sectors, including agriculture and education.

One participant emphasised the importance of technology in development as follows:

> *Technology is for sustainable development. As it is seen in the world today, without technology, there can't be development. Therefore, technology is very important, especially in the issues of development… be it in agriculture or education.*
>
> *This was complemented by a representative from Group A:*

This perspective reflects a broad understanding of technology as a foundational tool for societal advancement. Similarly, another participant highlighted the practical benefits of technology in everyday life:

> *"We have seen how technology helps save time"*
>
> *This was complemented by a representative from Group E*

ii. Role of females in technology and AI

Participants demonstrated a growing awareness and appreciation of the role of female students in technology and Artificial Intelligence (AI). The discussions reflected a shift from passive awareness to a more active recognition of the need for participation and engagement in technology-related fields. One participant highlighted the importance of taking initiative and recognising available opportunities:

> *"We are now aware of the many opportunities available in technology for the girl child and woman in general and the importance of showing up and participating, as here is where we can find a meaningful area to pursue… Everything in the world today involves technology. We cannot avoid it, so we must learn to use it. And as girls, we must participate."*
>
> *A representative from Group A*

This perspective emphasises a sense of responsibility and agency among female students to actively engage in technology, particularly as it becomes increasingly central to everyday life. Building on this view, another participant pointed to the importance of understanding gender dynamics within the field of technology:

> *"I think we have to really understand the ongoing gender bias in technology and the role we girls play, specifically in AI"*
>
> *A representative from Group B*

b. The challenges/barriers that discourage females from pursuing STEM and AI

Despite the identified benefits of the role of AI and women's participation in technology, recurring concerns were raised during the discussion as follows:

i. Lack of confidence with technology

A recurring concern among participants was the lack of confidence in engaging with STEM subjects, which was largely influenced by social perceptions and internalised beliefs about science and mathematics. Participants noted that STEM subjects are often perceived as difficult

and more suitable for boys, despite recognition of girls' actual ability in these areas. One participant described this perception as follows:

> *"Most girls are really afraid of science and mathematics. They think these subjects are for boys and run to art subjects, meanwhile, they were really good in mathematics, for example."*
>
> *A representative from Group D*

This statement highlights how subject choice is influenced not only by ability but also by perceived gender expectations within the learning environment. Building on this perspective, another participant emphasised the importance of challenging these perceptions and encouraging confidence among girls:

> *"I believe that technology is not for men alone. Girls should not be afraid of technology. When girls choose STEM education, it empowers and gives other girls the confidence to take science subjects and AI."*
>
> *A representative from Group E*

While the above reflections focus on confidence and encouragement, some participants extended the discussion to the broader societal value of female participation in STEM. One participant explained:

> *Only a female can understand female problems. We need to encourage more girls and women to engage in AI so as to bring appropriate change and more innovation to society.*
>
> *A representative from Group B*

Taken together, these views indicate that lack of confidence in STEM among female students is shaped by both social perceptions and learning environments. However, the responses also demonstrate that exposure, encouragement, and visible participation of girls in STEM can play a key role in strengthening confidence and shifting attitudes toward STEM and AI.

ii. Lack of Teachers' Support

A key barrier identified by participants was the influence of teachers' attitudes and classroom environments on girls' engagement in STEM subjects. Participants described how teacher perceptions and behaviours can either encourage or discourage female students from pursuing science-related disciplines.

One participant highlighted the presence of negative attitudes from some teachers towards girls' academic abilities:

> *"Some teachers harbour a negative mindset toward girls, believing that girls are not smart enough. Some of them make insensitive comments in the classrooms, telling female students that they will never pass their subjects or succeed in academics."*
>
> *A representative from Group C*

This perception reflects how classroom interactions can directly shape students' confidence and willingness to engage in STEM subjects. Building on this concern, another participant emphasised the role of fear and discouragement created in the classroom environment:

> *"Some male teachers like to instil fear in girls by telling them from nowhere that they will fail their science examinations."*
>
> *A representative from Group A*

iii. Knowledge gap

The students also felt that there was a huge knowledge gap between what they currently receive in schools and what is there in the real world that they think they ought to know. Moreover, since they appreciated the workshop and received the knowledge of AI, they felt that much more practical application in the classrooms was needed to make a meaningful impact on the community. They reported the following:

> *"Today, we learned about the importance of data and technology, something we didn't know existed before. We gained new knowledge and awareness of AI technology because initially, we thought that AI was just about robots, like in the movies. But today we learned that it's in our everyday activities, like phones."*
>
> *A representative from Group B*

This perspective is further reinforced by another participant who noted:

> *"We need to have this knowledge in our classroom, and we must learn how to work with AI practically from early classes."*
>
> *A representative from Group D*

iv. Limited facilities

Participants highlighted the lack of adequate learning facilities in schools, particularly access to computers and practical tools for engaging with technology, as a key barrier to understanding and sustaining interest in STEM and AI. This limitation was described as contributing directly to a gap between theoretical knowledge and practical application. One participant explained this clearly:

> *"There are very few facilities to learn and engage in technology, specifically AI. We learn in theory, but very little in practice. This limits our understanding and creates a lack of interest in STEM subjects."*
>
> *A representative from Group C*

v. Lack of role models

Participants identified the lack of visible female role models in STEM and AI as a key factor influencing their motivation and confidence in pursuing science-related fields. Many expressed that limited exposure to women in STEM roles contributes to the perception that these fields are predominantly male-dominated. One participant explained how this absence affects motivation in the classroom:

> *"You can experience a lack of motivation, especially when you don't see the same gender and only male teachers teach science in the classrooms. It confirms that science is only for boys"*
>
> *A representative from Group C*

c. The alternative mechanisms can be used to accelerate females into STEM and AI academics and career paths

Through the respective groups, the respondents made the following recommendations to improve awareness and inclusion of females in the field. They shared the following:

i. Change of attitude

By and large, the respondents emphasised the importance of teachers playing an active role in encouraging female students and recognising their capacity to perform in STEM subjects. One participant highlighted the need for supportive classroom environments:

> *"Teachers need to encourage girls instead of telling them that they are not smart enough to pursue science subjects."*
>
> *A representative from Group A*

Building on the role of teachers, participants also stressed that the internal mindset is equally important. They noted that confidence and self-belief among females are critical in overcoming discouragement and pursuing STEM pathways:

> *"Girls should believe in themselves and be confident to fulfil their dreams, no matter how much they are discouraged from taking up STEM subjects."*
>
> *A representative from Group B*

Extending this perspective further, some participants reflected on resilience as a necessary quality, emphasising that challenges are part of the journey and should not deter ambition:

> *"Even if you face a particular challenge, you can still achieve your dreams. Even the successful people you see today have passed through their own challenges."*
>
> *A representative from Group E*

In addition to confidence and resilience, participants also connected mindset to passion and purpose, particularly in relation to using technology to address societal challenges:

> *"We have to love what we do, especially girls and women, mostly in technology, to address the challenges of our community."*
>
> *A representative from Group C*

ii. Capacity building

Both the teachers and students emphasised that technology courses need to be introduced in schools from a very early stage. They stated:

> *"Technology subjects should be introduced in curricula from as early as primary school. This will help increase awareness of technology and AI in society."*
>
> *A representative from Group B*

Building on this, participants further stressed that engagement with technology should not be delayed until higher levels of education, but rather developed progressively throughout schooling:

> *"In the world today, it's so important to engage in STEM subjects or learn how to use computers while in secondary school and not wait until you are in university to engage with computers."*
>
> *A representative from Group D*

Extending this perspective, some participants emphasised the need for structured and policy-driven approaches to ensure that technology education is consistently implemented across all levels:

> *"ICT should be taught in the classrooms from the primary school level. Policies should be developed that mandate the teaching and learning of STEM subjects for everyone at all levels."*
>
> *A representative from Group A*

iii. Computer Facilities in Schools

The participants emphasised the importance of providing a supportive environment to support access to technology and knowledge acquisition. They stated:

> *"There should also be the availability of supporting facilities and resources. Schools should have labs and enough computers to practice on. Some schools have few computers for teachers and students, while some have none at all. The more we practice, the better we will become."*
>
> *A representative from Group E*

Building on the need for physical resources, participants also highlighted that access to facilities alone is not sufficient without complementary programs that actively promote engagement and awareness:

> *"More programs in schools and universities, and even the community, are needed to encourage and create awareness."*
>
> *A representative from Group C*

5. Discussion and Implication

The findings on female students' participation in STEM, technology, and AI can be interpreted through the lens of Social Cognitive Career Theory (SCCT), which emphasises the role of self-efficacy, outcome expectations, and environmental factors in shaping career interests and participation. Even though before the workshop, most of the respondents interact with AI daily, i.e., unlocking phones with face recognition technology, instructing Siri, your friend, Snapchat, or search engines, many participants demonstrated limited understanding of AI, often associating it with abstract or distant concepts such as robots. However, exposure to practical

examples of AI applications contributed to a shift in perception, increasing their awareness of its relevance in everyday life.

The content shared in the workshop was well-received, and the participants revealed a level of appreciation towards technology, especially AI. These findings resonate with (Harpale & Ekbote, 2025; Cave, Coughlan, & Dihal, 2019). These findings suggest that continued sensitisation is needed countrywide to increase awareness of this fast-growing emerging technology.

A key theme that emerged from the findings was the lack of confidence among female students in pursuing STEM subjects. This aligns with the concept of self-efficacy in SCCT, which refers to an individual's belief in their ability to succeed in a particular domain. Despite demonstrating comparable academic ability, participants expressed hesitation in engaging with STEM due to internalised beliefs and external discouragement. Nonetheless, by the end of the workshop, the females demonstrated a level of confidence in the value they bring to STEM and AI.

This shift in perception can also be understood through the lens of the Technology Acceptance Model (TAM). As participants became more familiar with practical applications of AI, their perceived usefulness of the technology increased, which is a key determinant of technology acceptance. Additionally, simplifying AI concepts during the workshop reduced perceived complexity, thereby enhancing perceived ease of use. These changes contributed to greater openness toward engaging with AI-related learning and career pathways.

Challenges facing females in STEM education

The findings revealed a host of perceived challenges in engaging in STEM academically. These include negative mindsets both by teachers and students towards females engaging in STEM; lack of role models, general knowledge gap around the issues of emerging technologies, and limited resources. This suggests that self-efficacy is not solely a function of competence but is significantly shaped by social and environmental influences. Environmental factors further played a critical role in shaping participation. Negative attitudes from teachers, limited access to technological resources, and the absence of visible female role models contributed to reinforcing perceptions that STEM and AI are male-dominated fields. According to SCCT, such contextual barriers can constrain career aspirations by limiting both exposure and encouragement. Conversely, the workshop environment provided a supportive space that fostered engagement, suggesting that targeted interventions can positively influence both self-efficacy and outcome expectations.

These findings resonate with previous scholars (Wilkins-Yel, Arnold, Bekki, Natarajan, Bernstein, & Randall, 2022; Abe & Chikoko, 2020; Gladstone & Cimpian, 2021; Arakpogun, Elsahn, Olan, & Elsahn, 2021). They suggest the importance of reinforcing positive attitudes and mindset shift of teachers and students towards STEM, technology, and AI through in-service teacher training, provision of teaching and learning resources, close monitoring and inspection of schools, and encouraging teachers and students to adopt technology in the classroom for teaching and learning. Moreover, more gender awareness programs demystifying

gender norms and the role of females in society versus male-oriented career paths are needed. These programs can be incorporated into pre-service education curricula as well as in-service teacher training for capacity building. Moreover, in terms of under-resourced computer facilities in schools, each school should be provided with at least 2 to 3 computers sufficient to host computer clubs as an extracurricular activity outside the class syllabus. This can be facilitated by the Government, as well as development partners and philanthropists who are already in the ecosystem, supporting the various initiatives of the education sector. Overall, the findings demonstrate that increasing female participation in AI requires not only access to knowledge but also deliberate efforts to strengthen confidence and create enabling environments that support sustained engagement.

As far as alternative methods to improve women's participation in STEM and AI are concerned, the majority of the respondents suggested the need to introduce STEM and AI at very early education levels, such as primary schools. Others reckoned that technology courses should be mandatory at school. As various scholars highlight, children aspire to develop those professions that they are exposed to within their environments or that come to them through the media (Chambers, Kashefpakdel, Rehill, Percy, 2021). As such, this finding recommends that policymakers revise existing curricula and introduce technology at the primary school level.

The respondents also touched on the significance of STEM role models in the classrooms. This can be achieved by introducing programs that link students to their potential role models through class lecturers or after-school activities. Moreover, outside the classroom is an opportunity for external stakeholders to form an association of women in STEM and AI professionals who, among other activities, can visit schools to spread awareness of STEM and AI careers and mentor students into these academic and career paths. Apart from the purpose of giving to the community, members of the group could benefit from the diverse network of women professionals and create a safe environment for women to share knowledge, expertise, and wisdom in navigating the STEM career corridors.

While these findings align with studies highlighting gendered barriers in STEM participation (Wilkins-Yel et al., 2022; Abe & Chikoko, 2020), they contrast with research suggesting that exposure alone is sufficient to increase STEM uptake among female students in some contexts. In this study, exposure was necessary but not sufficient without addressing structural barriers such as teacher attitudes and resource constraints.

While previous studies have highlighted structural and social barriers affecting female participation in STEM, this study contributes by demonstrating how short-term, targeted exposure interventions can significantly influence both self-efficacy and outcome expectations among female students. In contrast to literature that often emphasises long-term systemic change, these findings suggest that even localised, workshop-based engagements can play a critical role in shifting perceptions and stimulating interest in AI. This positions awareness programs not merely as supplementary activities, but as strategic entry points for strengthening participation in emerging technology fields, particularly in under-resourced contexts.

6. Limitation

Given that evidence of female engagement in AI in the context of Tanzania is relatively non-existent, examples and literature relating to female engagement in general technology, in most cases, are drawn upon where appropriate. Therefore, this paper significantly covers a literature gap by contributing to AI literature in the Tanzanian context.

7. Conclusion and Recommendations

This study set out to investigate the perceptions, awareness, and participation of female students in Artificial Intelligence (AI) within the Tanzanian context. Drawing on insights from an AI sensitisation workshop, the findings reveal that while initial awareness of AI among participants was limited and often shaped by misconceptions, targeted exposure significantly improved understanding, confidence, and interest in pursuing STEM-related pathways.

From a theoretical perspective, the study contributes to the application of Social Cognitive Career Theory by demonstrating how self-efficacy and outcome expectations among female students can be positively influenced through short-term learning interventions. Additionally, the integration of the Technology Acceptance Model provides insight into how increased perceived usefulness and reduced complexity of AI can enhance students' openness to engaging with emerging technologies. In doing so, the study extends existing literature by linking technology awareness initiatives with career development processes in a developing country context.

From a policy perspective, the findings directly respond to the identified gaps in awareness, access, and confidence among female students in Tanzania. Addressing these challenges requires deliberate and sustained efforts to create enabling environments that support female participation in STEM and AI. This includes integrating technology and AI concepts into early education curricula to bridge the awareness gap, strengthening teacher training to address gender biases and improve classroom support, and investing in basic technological infrastructure to enhance practical learning opportunities. Furthermore, structured mentorship programs and increased visibility of female role models in STEM are essential in countering gendered perceptions and fostering confidence among females. By addressing these systemic and perceptual barriers, policymakers can create pathways that not only increase participation but also sustain long-term engagement of women in AI and emerging technology fields.

Methodologically, this study demonstrates the value of combining workshop-based interventions with qualitative inquiry to generate context-specific insights into emerging technology adoption. In contexts where formal data on AI awareness is limited, such approaches provide a practical and scalable means of understanding and influencing youth engagement.

As AI is a significantly fast-growing technology, Africans, particularly females, must participate in the development of technologies that consider the socio-economic and infrastructural realities of Africa, to craft AI solutions that serve the continent's priority needs (Gwagwa, Kachidza, Siminyu, & Smith, 2021). However, caution is warranted regarding the unethical use of AI technologies, which may have implications for local communities and human rights, affect employment, and strain resources, potentially discouraging government investment in AI (Gwagwa, Kachidza, Siminyu, & Smith, 2021). Nonetheless, this study advocates for the responsible adoption of AI for development through cultivating local skills, inspiring early interest in STEM career fields, and fostering inclusive, STEM-supportive

environments for women in education settings. In doing so, societies can reap the benefits of AI through sustainable and contextually relevant solutions that reflect local realities. This paper provides a foundation for future research and policy dialogue on inclusive AI development in emerging contexts.

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